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ROLLING MILL, ESPECIALLY AN EDGING MILL, FOR HOT OPERATION

The invention concerns a rolling mill, especially an edging mill for hot operation, with a pair of rolls, which are arranged with their center axes vertical, can be adjusted relative to each other, and are connected to at least one rotary drive by means of cardan shafts.

Edging mills of this type are widely used as vertical rolling stands or edging stands with one or more crossheads, on which the heavy rotary drives for the rolls are supported (DE 1 602 177 A). The rolls can also be supported in horizontally cross-sliding cassettes (EP 0 491 785 B1). The cassette can also be vertically displaced (EP 0 493 430 B1. In accordance with an older proposal (DE 2 227 549 A), the rolls can be taken out in the upward direction vertically between the rotary drives.

The previously known rotary drives and adjustment drives have the disadvantage that this type of construction is

technically complicated and not very reliable. Due to the large number of working action intervals of drive parts moving within each other, a great deal of wear occurs, and this results in high maintenance costs. The previously known drive arrangement is also associated with poor accessibility for maintenance work. Other disadvantages result from the sluggish adjustment response of the edging rolls, which are very heavy, cause tremendous friction and require large lever arms for the adjustment.

The objectives of the invention are to produce a more favorable adjustment response with lower displaced masses, to reduce friction, and to achieve better lever arm ratios.

In accordance with the invention, these objectives are achieved by stationary installation of the rotary drive for the two rolls below the mill floor level and by drive connection of the rotary drive with the respective cardan shaft by a stationary transmission. This allows faster and easier adjustment of the edging rolls, and, in addition, the displaced masses are smaller. The transmission is no longer moved together with the edging rolls but rather is anchored on the foundation or areas of the foundation. The lower displaced weight results in less friction. The lever arm relationships are also more favorable due to shorter adjustment devices.

Furthermore, maintenance costs are reduced, and maintenance is easier, because the accessibility on the level of the mill floor and on the level of the foundation is easier. All of these advantages together result in greater plant availability and greater operational readiness, and this makes it possible to achieve optimized product quality.

In accordance with a refinement of the invention, the displaced masses can be further reduced by connecting the rotary drive to each cardan shaft by means of a continuous drive shaft and detached bevel gears on both sides and a spur gear.

In a further refinement, weight can also be locally adjusted by installing the adjustment drives on both sides of the vertical rolls above the mill floor level. The edging rolls can be freely lifted out upwardly between the adjustment drives and can be managed during installation.

In accordance with a refinement of the invention, the drive components located in the lower foundation area are protected by deflector plates that are mounted on the receivers for the heads of the cardan shafts and that can be moved together with the rolls.

In this connection, means for collecting and carrying the process waste materials to be removed are created by the

formation of an essentially vertical, first shaft by the movable deflector plates.

In a refinement of this system, a second shaft that follows the first shaft is formed between the stationary spur gears of ~~the cardan shafts by stationary deflector plates.~~

The protection of the lower-lying drive components can be further enhanced by the stationary deflector plates forming a trapezoidal or conical inlet that follows and is directly opposite the movable deflector plates.

The process waste materials that are collected in the first shaft and the second shaft can be further conveyed and disposed of by providing a trough-like collecting pit below the second shaft for carrying away dirt, scale, wastewater and the like.

The rolling mill is illustrated in the drawing and explained in greater detail below.

The sole drawing shows a front elevation of the rolling mill, in which the rolling stock moves perpendicularly to the plane of the drawing.

The rolling mill, which is shown in cross section perpendicular to the rolling direction, is constructed as an edging mill for hot operation. The direct deformation zone 1 lies above the mill floor level 2. The rolls 3 and 4 are

arranged with the center axes 5 vertical and are connected to at least one rotary drive 8 by means of cardan shafts 6 and 7.

The special features, then, are the stationary installation of the rotary drive 8 for the two rolls 3 and 4 below the mill ~~floor level 2 and the drive connection of the rotary drive 8~~ with a cardan shaft 6, 7 on each side by a stationary transmission 9.

For drive transmission, starting from the rotary drive 8 (which consists of a heavy electric motor), the driving power is transmitted by means of a continuous, rotatably supported drive shaft 10 and detached bevel gears on both sides (bevel gear steps) 11 and a one-step spur gear 12 on each cardan shaft 6 and 7.

In contrast to the installation of the rotary drive 8 below the mill floor level 2 on a foundation 13 built at a low level, the adjustment drives 14 and 15 are arranged on both sides of the vertical rolls 3, 4 above the mill floor level 2.

Between the paired adjustment drives 14 and 15 on both sides, hydraulically actuated piston-cylinder units 16 and 17 for roll crossheads 18, 19 are mounted in the columns 20 of the rolling stand.

Deflector plates 24 and 25 are mounted on receivers 22 and 23 for the heads of the cardan shafts 6, 7 and move together with the rolls 3, 4 when the rolls are adjusted. The pair of deflector plates 24, 25 forms a first, vertical shaft 26 or two ~~adjacent partial shafts 26a and 26b.~~

A second shaft 27 is formed between the stationary spur gears 12 of the cardan shaft 6, 7. In consists of stationary deflector plates 27a, 27b.

The stationary deflector plates 27a, 27b form a trapezoidal or conical inlet 28 that follows and is directly opposite the movable deflector plates 24, 25.

A trough-like collecting pit 29 is formed in the foundation below the second shaft 27 for carrying away the collected dirt, scale, wastewater and the like.

List of Reference Numbers

1 direct deformation zone

2 mill floor level

3 roll

4 roll

5 center axis

6 cardan shaft

7 cardan shaft

8 rotary drive

9 stationary transmission

10 drive shaft

11 bevel gear

12 spur gear (spur gear step)

13 foundation

14 adjustment drive

15 adjustment drive

16 piston-cylinder unit

17 piston-cylinder unit

18 roll crosshead

19 roll crosshead

20 roll column

21

22 receiver for the head of a cardan shaft

23 receiver for the head of a cardan shaft

24 movable deflector plate

~~25 movable deflector plate~~

26 first shaft

26a partial shaft

26b partial shaft

27 second shaft

27a stationary deflector plate

27b stationary deflector plate

27 trapezoidal or conical inlet

28 trough-like collecting pit